

NUCLEAR SCIENCE AND ENGINEERING®

(ISSN: 0029-5639)

THE RESEARCH JOURNAL OF THE AMERICAN NUCLEAR SOCIETY

ANS OFFICERS

Harry Lawroski
president

Corwin L. Rickard
vice president/president elect

Sherman Naymark
treasurer

Raymond D. Maxson
assistant treasurer

Octave J. Du Temple
executive director

DIXON CALLIHAN, *Editor*

MELVIN L. TOBIAS, *Associate Editor*

MARGE WILLIAMS, *Administrative Assistant*

Union Carbide Corporation
Nuclear Division
Oak Ridge, Tennessee 37830

KARL WIRTZ, *Associate Editor, Europe*

ANTON BAYER, *Editorial Assistant*

Kernforschungszentrum Karlsruhe
D-7500 Karlsruhe
Postfach 3640
Germany

ANS PUBLICATIONS STAFF

W. Michael Diekman
publications manager

Joann Hollensteiner
administrative assistant

Rhonda M. Welfare
copy editor

Siegfried H. Krapp
production manager

Editorial Advisory Committee

Manson Benedict	Frank G. Dawson
E. Richard Cohen	D. H. Gurinsky
E. C. Creutz	A. F. Henry
E. Critoph	Hugh C. Paxton
Fred W. Thalgott	

COMPOSITION

Beljan, Dexter, Michigan 48130

Indexed in "Engineering Index" and
Abstracted in "INIS Atom Index"

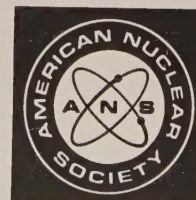
Volume 77
January, February
March, April 1981

NUCLEAR SCIENCE AND ENGINEERING (ISSN: 0029-5639) is published monthly by the American Nuclear Society, Inc., with business offices at 555 N. Kensington Ave., La Grange Park, Illinois 60525; telephone 312/352-6611. The subscription rate is \$80 per volume or \$220 for three volumes per calendar year; overseas subscribers add \$54 per year for postage and handling. Single copy price is \$29 for current and back issues. Microfiche subscriptions are also available at the same rates. Inquiries about the distribution and delivery of NUCLEAR SCIENCE AND ENGINEERING and requests for changes of address should be directed to the American Nuclear Society. Allow 6 weeks for a change to become effective. NUCLEAR SCIENCE AND ENGINEERING is printed in Danville, Illinois 61832, by Interstate Printers and Publishers, Inc. Second-class postage is paid at La Grange, Illinois, and at additional mailing offices. Copyright © 1981 by the American Nuclear Society, Inc. Trademark registered in Canada.

Findings reported and opinions expressed in this publication by the authors are their own and do not necessarily

reflect the opinions of the editors, the American Nuclear Society, or the organizations with which the authors are affiliated, nor should publication of author viewpoints or identification of materials or products be construed as endorsement by this publication or the Society. Address all manuscript and editorial communications to the editorial offices, NUCLEAR SCIENCE AND ENGINEERING, Building 9204-1, P. O. Box Y, Oak Ridge, Tennessee 37830. European authors may send communications to Karl Wirtz, Karlsruhe, Germany.

PHOTOCOPYING: The code on the first page of an article in this journal indicates the copyright owner's consent to limited copying of articles for personal or internal use, or for use of specific clients. Consent is given on the condition that the copier pay the stated per-copy fee through the Copyright Clearance Center, 21 Congress St., Salem, Massachusetts 01970, for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. Consent is *not* given for other copying, such as for general distribution, advertising or promotional, creating new collective works, or resale.



Contents of Volume 77

NUMBER 1, JANUARY 1981

TECHNICAL PAPERS

- | | | |
|----|---|---|
| 1 | Integral Transport Theory Formalism for Diffusion Coefficient Calculations in Wigner-Seitz Cells | <i>Pierre Benoist</i> |
| 13 | Interface and Source Problems by a Transport Theoretic P_N Approximation | <i>K. Ganguly, A. Sengupta</i> |
| 20 | Elastic Nuclear Plus Interference Cross Sections for Light-Charged Particles | <i>Sterrett T. Perkins,
Dermott E. Cullen</i> |
| 40 | Progress in Integral Data and Their Accuracy: Average Neutron Cross Sections in the Californium-252 Benchmark Field | <i>W. Mannhart</i> |
| 51 | Measurements of the Fast Neutron Emission Spectrum of Californium-252 by Means of Proton-Recoil Spectrometers | <i>H. Jasicek, F. Bensch</i> |
| 58 | Determination of the Capture Width of the 27.7-keV s-Wave Neutron Resonance in Iron-56 | <i>K. Wisshak, F. Käppeler</i> |
| 71 | Computational Benchmark for Neutron Penetration in Iron | <i>J. S. Hendricks, L. L. Carter</i> |
| 84 | A Study of the Penetration of a Hot Liquid Pool into a Vertical Solid Surface | <i>Rouyentan Farhadieh</i> |
| 92 | On the Two-Dimensional Analysis of Fluid Flow and Heat Transfer in Rod Bundles with Arbitrary Arrangement | <i>Sun Wong, Kawei Chen</i> |

TECHNICAL NOTES

- | | | |
|-----|--|--|
| 107 | Neutron Utilization Parameter for Complex Coupled Systems | <i>Charles R. Marotta</i> |
| 110 | Fast-Neutron Total and Elastic- and Nonelastic-Scattering Cross Sections of Elemental Nickel | <i>A. B. Smith, P. T. Guenther,
J. F. Whalen</i> |

- | | | |
|-----|--------------------------------------|--|
| 114 | ANNOUNCEMENT OF CURRENT PUBLICATIONS | |
|-----|--------------------------------------|--|

Contents of Volume 77

(Continued)

NUMBER 2, FEBRUARY 1981

TECHNICAL PAPERS

- | | | |
|-----|---|--|
| 119 | Particle Transport Calculations with the Method of Streaming Rays | <i>W. L. Filippone, S. Woolf, R. J. Lavigne</i> |
| 137 | A Method for Calculating Power Distributions in Boiling Water Reactors Using In-Core Detector Readings | <i>Sadao Uchikawa, Hiroshi Motoda</i> |
| 146 | Yields of Short-Lived Fission Products Produced by Thermal-Neutron Fission of Plutonium-239 | <i>J. K. Dickens, J. W. McConnell, K. J. Northcutt</i> |
| 153 | High-Order Flux Perturbations | <i>A. Dubi, Donald J. Dudziak</i> |
| 157 | The Distribution of Thermal Neutron Cross Sections | <i>Yu. V. Petrov, A. I. Shlyakhter</i> |
| 168 | A Systematic Study on the Neutron Skyshine from Nuclear Facilities—Part I. Monte Carlo Analysis of Neutron Propagation in Air-over-Ground Environment from a Monoenergetic Source | <i>Takashi Nakamura, Toshiso Kosako</i> |
| 182 | A Systematic Study on the Neutron Skyshine from Nuclear Facilities—Part II. Experimental Approach to the Behavior of Environmental Neutrons Around an Electron Synchrotron | <i>Takashi Nakamura, Toshiso Kosako, Katsumi Hayashi, Shuichi Ban, Kazuaki Katoh</i> |
| 192 | Nonlinear Transient Analysis of Light Water Reactor Steam Generators Using an Implicit Eulerian Method | <i>Mark W. Crump, John C. Lee</i> |
| 211 | The Solubility of Nickel Ferrite in Aqueous Boric Acid Solution | <i>Y. L. Sandler, R. H. Kunig</i> |

TECHNICAL NOTES

- | | | |
|-----|--|------------------------------------|
| 219 | Rigorous Homogenized Diffusion Theory Parameters for Neutrons | <i>Riccardo A. Bonalumi</i> |
| 229 | An Equivalence Relation for a Lattice of Annular Absorbers | <i>M. Segev</i> |
| 235 | Reactor Fuel Burnup Calculation for a Square Lattice Cell | <i>Y. Y. Chang, S. K. Loyalka</i> |
| 250 | The Effect of Self-Shielding of the Iron Inelastic Scattering Cross Section on Neutron Spectra | <i>Hideki Takano, Kunio Kaneko</i> |

(Continued)

Contents of Volume 77

(Continued)

NUMBER 2, FEBRUARY 1981

- 256 Cross Sections for $^{19}\text{F}(n,p)^{19}\text{O}$ and $^{19}\text{F}(n,\alpha)^{16}\text{N}$ from Threshold to 9 MeV *Donald L. Smith, James W. Meadows, James F. Whalen*
- 263 Decay Schemes for Radionuclides of Potential Importance in the Nuclear Fuel Cycle *D. C. Kocher*

BOOK REVIEW

- 266 Heat Conduction, M. Necati Ozisik *Joel Weisman*
Heat Conduction, S. Kakac and Y. Yener

- 267 ANNOUNCEMENT OF CURRENT PUBLICATIONS

Contents of Volume 77

(Continued)

NUMBER 3, MARCH 1981

TECHNICAL PAPERS

- | | | |
|-----|---|---|
| 273 | A Model of Countercurrent Steam-Water Flow in Large Horizontal Pipes | <i>Bart J. Daly,
Francis H. Harlow</i> |
| 285 | Sensitivity of Light Water Reactor Fuel Cycle Parameters and Costs to Uncertainties in Thermal Nuclear Data and Methods | <i>J. M. Ryskamp, D. R. Harris,
M. Becker</i> |
| 297 | Event Sequences and Consequence Spectrum: A Methodology for Probabilistic Transient Analysis | <i>A. Amendola, G. Reina</i> |
| 316 | Generalized Perturbation Theory for Nonlinear Systems from the Importance Conservation Principle | <i>A. Gandini</i> |

TECHNICAL NOTES

- | | | |
|-----|---|---|
| 344 | A Stability Analysis for Nuclear Reactor Systems | <i>Trine-Yie Dawn</i> |
| 351 | Using Orthogonal Functions with a Finite Element Method for Approximating Even-Parity Neutron Flux in Slab Geometry | <i>B. A. Splawski, A. K. Ziver,
J. Galliara</i> |
| 354 | Stability Analysis for Integro-Differential Coupled-Core Reactor Models | <i>M. Podowski</i> |
| 360 | Effectiveness of an Adaptive Acceleration Method for Inner Iterations in Some Neutron Diffusion Codes | <i>Toichiro Fujimura,
Tasushi Matsui</i> |
| 367 | A Semianalytic Method for the Solution of the Neutron Transport Equation in Plane and Spherical Geometries | <i>J. K. Fletcher</i> |

- | | |
|-----|--------------------------------------|
| 373 | ANNOUNCEMENT OF CURRENT PUBLICATIONS |
|-----|--------------------------------------|

Contents of Volume 77

(Continued)

NUMBER 4, APRIL 1981

CRITICAL REVIEW

- 377 Treatment of Anisotropic Scattering in Numerical Neutron Transport Theory *H. Brockmann*

TECHNICAL PAPERS

- 415 Boundary Perturbation Theory *Edward W. Larsen, G. C. Pomraning*
- 426 Determination and Application of Generalized Bias Operators Using an Inverse Perturbation Approach *Y. Ronen, D. G. Cacuci, J. J. Wagschal*
- 438 On Linear Extrapolation Distances, Extrapolated End-points, and Eigenvalues *F. Rahnama, G. C. Pomraning*
- 444 Measurement of the Neutron-Induced Fission Cross Sections of Americium-241 and Americium-243 Relative to Uranium-235 from 0.2 to 30 MeV *J. W. Behrens, J. C. Browne*
- 454 Fission Neutron Multiplicity for the $^{242m}\text{Am}(n,f)$ Reaction *R. E. Howe, J. C. Browne, R. J. Dougan, R. J. Dupzyk, J. H. Landrum*
- 463 The Ratio of D-T to D-D Reactions as a Measure of the Fuel Density-Radius Product in Initially Tritium-Free Inertial Confinement Fusion Targets *T. E. Blue, D. B. Harris*
- 470 Film Boiling and Vapor Explosions from Small Spheres *Chunkuan Shih, M. M. El-Wakil*
- 480 Stability Monitoring of Boiling Water Reactors by Time Series Analysis of Neutron Noise *B. R. Upadhyaya, M. Kitamura*

TECHNICAL NOTES

- 493 Application of Computed Tomography Techniques to Pinhole Images of Nuclear-Reactor Test Fuel Rods *G. J. Berzins, G. C. McKinnon, R. H. T. Bates, A. H. Lumpkin*
- 496 Deposition of Cobalt-60 on the Stainless-Steel Surface Used for the Primary Cooling System of a Boiling Water Reactor *Shunsuke Uchida, Masao Kitamura, Yasunori Matsushima, Koichi Yonezawa, Katsumi Ohsumi, Minoru Miki*

(Continued)

Contents of Volume 77

(Continued)

NUMBER 4, APRIL 1981

LETTERS TO THE EDITOR

- 502 Comments on "A Nodal Green's Function Method for Multidimensional Neutron Diffusion Calculations" *Nicholas G. Demas*
- 502 Reply to "Comments on 'A Nodal Green's Function Method for Multidimensional Neutron Diffusion Calculations'" *R. D. Lawrence, J. J. Dorning*
- 504 ANNOUNCEMENT OF CURRENT PUBLICATIONS
- 509 VOLUME 77 AUTHOR AND SUBJECT INDEXES